

## **Characterization of the Electromechanical Properties of EAP materials**

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Electroactive polymers (EAP) are a new class of materials currently being considered for a variety of actuation applications. Their large electrically induced strains (bending or extensional), low density, ease of processing, and mechanical flexibility offer advantages over traditional electroactive materials. However, before these materials can be properly exploited, their electrical and mechanical behavior must be properly quantified. Two general types of EAP can be identified. The first type is ionic base, which requires relatively low voltages (<10V) to achieve large bending deflections (over 90°). This class usually needs to be hydrated and electrochemical reactions may occur. The second type of EAP involves electrostrictive and/or Maxwell stresses. This type of materials requires large electric fields (>100MV/m) to achieve large extensional/contractual deformation (>4%). Some of the difficulties in characterizing EAP include: nonlinear properties, large compliance (large mismatch with metal electrodes), non-homogeneity formed during processing, etc. In order for this technology to fully mature, the authors are developing characterization techniques to quantify their electroactive responses and material properties. The emphasis of the current study is on addressing electromechanical issues related to the Ion-exchange type EAP also known as IPMC. The analysis, experiments and test results will be discussed in this paper.